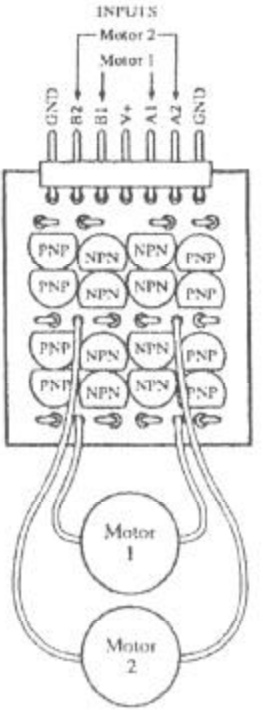
Mini Dual H-Bridge Motor Driver Kit

Easily control two small DC motors via computer!

Mondo-tronics

This kit controls two small DC motors from logic level (5 volt TTL) signals. It permits complete control: forward, reverse or stop. It is ideal for control of miniature robots, model cars and trucks. Use it wherever you require easy computer control of low voltage DC motors.



- *Tiny* - just 25x28x7 mm thick (1 x 1.1 x 0.25inch)
- *Light* - weighs under 5 grams (0.2 ounce)
- *Low Load* - inputs use less than 1 milliamp
- *Strong* - Provides up to 300 mA per motor.
- *Logical* - uses standard 5V logic level inputs.
- *Run motors from 5 Volts* - No separate power supply needed.
- *Interchangeable* - standardized connections with our other driver boards.

Easily assembles in under an hour.
You will need: soldering iron for electronics, solder, side cutter, and two small 3 to 5 V DC motors.
Electronics experience is helpful but not required.

Mondo-tronics, Inc. 4286 Redwood Hwy #226
San Rafael, California 94903
Phone (415) 491-4600 ♦ Fax (415) 491-4696 ♦ Web www.robotstore.com
E-mail: info@mondo.com

We fully guarantee the quality and completeness of this kit.
If you suspect aught be gang agley, get in touch! You'll get attention!

Made in the USA exclusively for Mondo-tronics by TFX, 1961 Taggart Way, Galt's Gulch, Co.

To be or not to be; that is binary.

Rev. 1.1

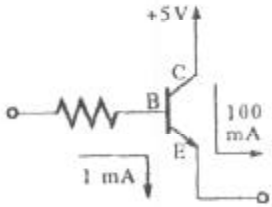
1 - How it Works

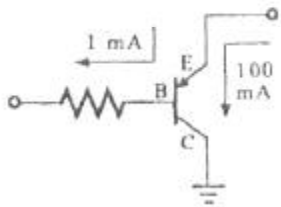
Microprocessors and other logic-type integrated circuits provide little output current, typically from 1 to 30 milliamps (mA), depending on the family of chip. However, motors typically require 80 mA or more to run.

Family @ 5	Output (mA)	
	HI	LO
LS	0.4	8
ALS	15	24
HC	4	4
ACT	24	24
HCT	4	4
THIS KIT NEEDS	<1	<1

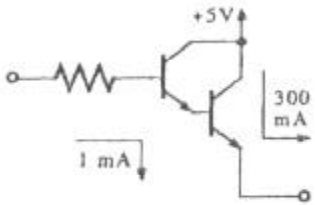
This circuit amplifies the small, low current signal to provide a higher current suitable for a small (3 to 6 volt) motor, and also provides forward and reverse control.

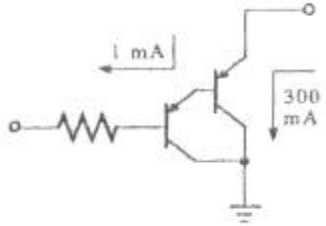
A transistor permits the small current from a logic gate (such as an output from a microprocessor) to control a much higher current.





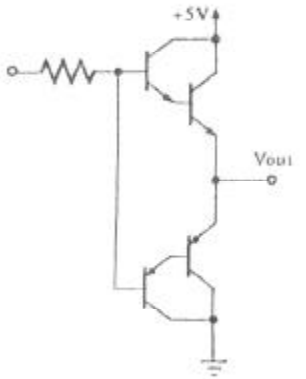
A "Darlington pair" (two transistors connected shown) can deliver an even higher output current. (This kit uses two discrete transistors to create a Darlington pair, however, they are also available with two transistors in one package.)





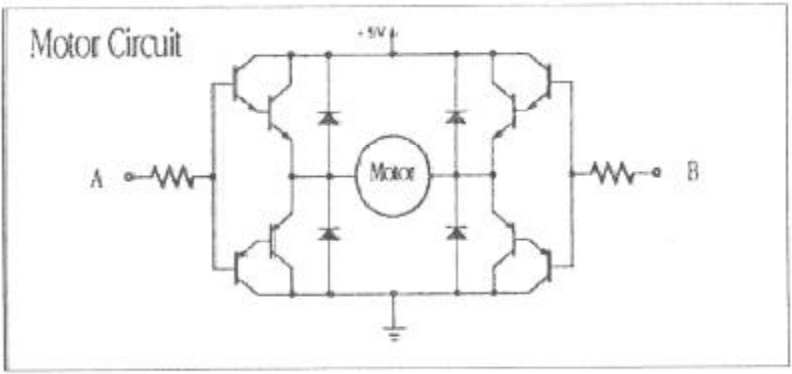
A "totem pole" of Darlington pairs will "source" (produce a positive voltage) or "sink" (accept a negative voltage) enough power to run a small motor.

For current to flow through the top Darlington pair (made of NPN type transistors) the input voltage must be higher than Vout. For current to flow through the bottom Darlington pair (made of PNP type transistors) the input voltage must be lower than Vout.



The difference produces a "dead band" of input voltages where neither transistor pair will operate. This "break before make" (in old telephone relay terminology) prevents this circuit from short circuiting the power supply when it switches - a major problem with some other types of H-Bridge circuits.

Finally, an "H-Bridge" is constructed from two totem poles, and provides directional control of the motor with just a single supply voltage.



A motor can produce a reverse voltage when it switches or if it is spun by an external force (it becomes a generator). The four diodes snub this inductive kickback and protect the transistors.

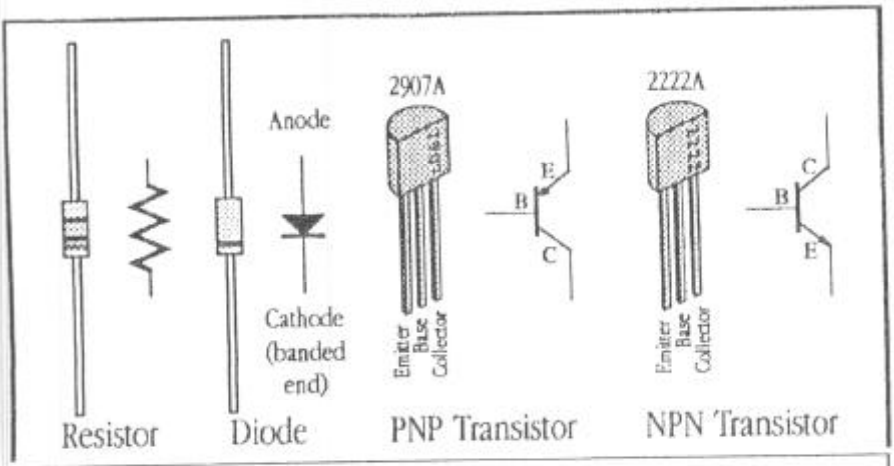
For more information on electronics, consult the references at your local library or check our Robot Store catalog.

2 – Parts

As you assemble the circuit board, refer to the list below and to the instructions. The drawings below show the parts and their schematic symbols. Check your kit of parts with this list.

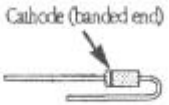
	Qty	Description
1)	4	Resistor, 1.3 K, 1/8 W (brn, orng, red, gold)
2)	8	Diode, IN4148
3)	8	Transistor, PNP type, PN2907A
4)	8	Transistor, NPN type, PN2222A
5)	1	PC Board, mini Dual H-Bridge, TFX CM 2.0
6)	1 *	Header, 7 pin, 0.1" spacing
7)	1	Instructions (these)

*Indicates optional part. Use as required in your application.



In addition, you will need a microtip soldering iron for electronics, solder, side-cutter, 5 volt power source and two small motors (3 to 5 Volts DC).

3 - Assembly



1) Begin by bending one lead of each diode as shown. Be sure to bend the lead opposite the banded cathode end of the diode, as shown.

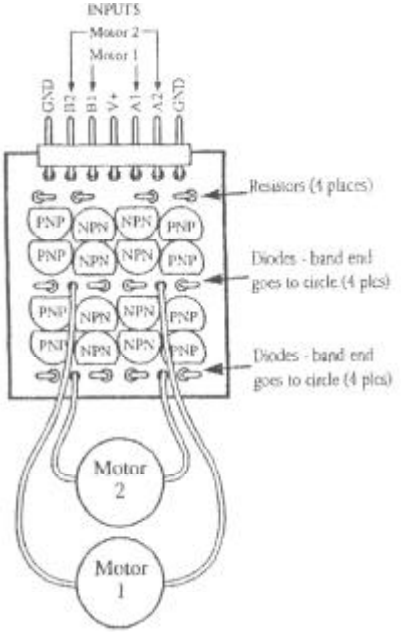
2) Next, bend one lead of each resistor (either end will do), as shown.

3) Insert one part into its marked location on the board. Observe that it is correct for its location and that it is oriented correctly.

4) Double check the part's location and orientation (especially the two different kinds of transistors) before proceeding with soldering.

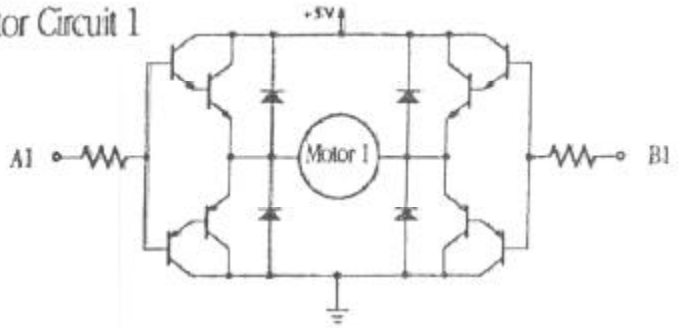
5) Carefully solder the leads of the part. (If you have never assembled electronics before, read section 5 first!) When the solder has cooled, clip the lead close to the board.

6) Repeat for all parts.

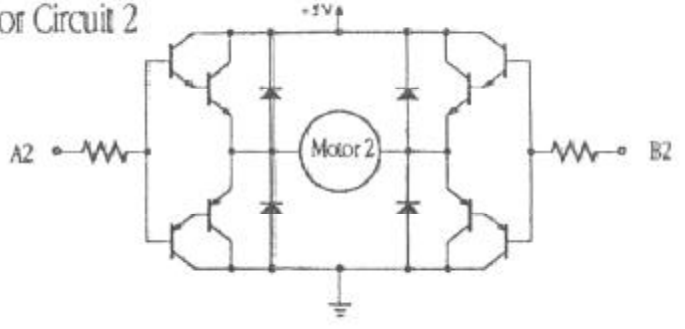


The drawings below show the schematic and connections for the Dual Mini H-Bridge Motor Driver.
For a complete description of overall operation, see section 1.

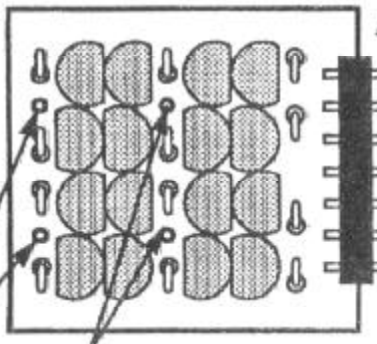
Motor Circuit 1



Motor Circuit 2



Connections



This connector is reversible. Flip it over to switch controls for motors 1 & 2.

"V+" to +5 Volts
"GND" to ground (note only one "GND" need be used)

To Motor 2

To Motor 1

4 - Connections & Testing

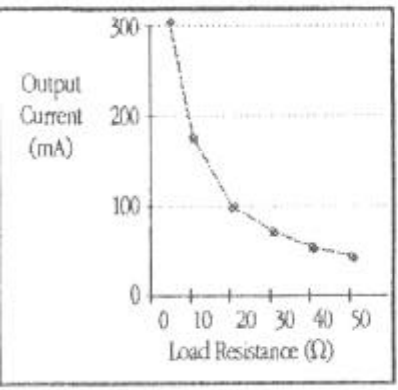
♦ *Are all parts installed in correct location and orientation? If not, carefully unsolder, clean the holes, and replace properly.*

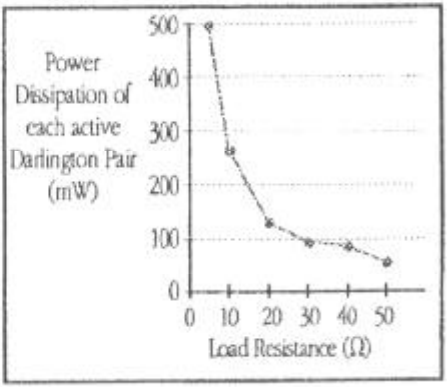
♦ *Are all leads trimmed, with clean solder joints, no excess solder, short-circuits, or cold joints? If not, trim, resolder or clean as necessary.*

Attach the circuit to a 5 volt power source, a couple of small motors and fire it up! Connect the motor input and output pins as shown in the table, and observe the motors for proper rotation.
If a motor runs opposite from the direction desired, simply reverse the two wires at the motor.

INPUT			OUTPUT	
A	**B**		**A**	**B**
L	L	None	L	L
L	H	Clockwise	L	H
H	L	Counter-Clockwise	H	L
H	H	None	H	H

Input: Maximum input voltage: 6 V (5 V recommended)
Output: Maximum output current: 300 mA, continuous; (500 mA peak)
500 mW total power dissipation, each motor circuit.





Test conditions:
V+ = 5V. Input signals provided by a 74HCT00 output (less than 1 mA signal)

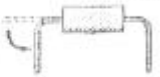
5 - Assembling Electronics

If you have never assembled electronics you should read about the basics before you begin. The steps below outline the basic procedures for preparing, soldering and inspecting many kinds of electronic components. With a few tools and a little patience you will have no trouble assembling, testing and using your kit.

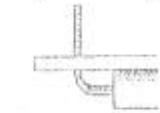
F5.1 - Basic tools needed:
Soldering iron, small sponge, electronic solder, needle nose pliers, side cutters. Optional: Spare soldering iron tip, solder wick, flux remover.
Plug in the iron, and moisten the sponge with water. When the iron is hot, "tin" the tip with a small amount of solder. (Replace the tip if it is corroded).
Wipe the tip across the damp sponge frequently to keep it clean. A clean, well-tinned tip does best. Spoil yourself.

5.1

F5.2 - Bend the component leads to fit the holes on the board.


5.2

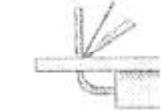
F5.3 - Insert the component, observing any special orientation it may require. Bend the leads enough to hold the part flush against the board, but do not overbend.


5.3

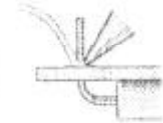
F5.4 - Wipe the tip clean and tin it with a small amount of solder.

5.4

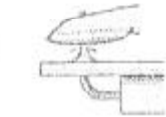
F5.5 - Heat the joint by placing the soldering iron's tip against both the component lead and the circuit board pad.


5.5

F5.6 - After a moment of heating, touch the solder to the lead & pad only. (If touched to the iron it will blob up.) When the solder flows, remove it and hold the tip in place for one second. Remove the iron without moving the part and let the joint cool.


5.6

F5.7 - Trim excess component lead with the side cutter. Parts with short leads do not need to be trimmed. Inspect the joint. A good solder joint blends the lead and pad smoothly together and has a smooth, bright finish.


5.7